



BSI Standards Publication

Conservation of Cultural Heritage — Guidelines and procedures for choosing appropriate lighting for indoor exhibitions

National foreword

This Published Document is the UK implementation of CEN/TS 16163:2014.

The UK participation in its preparation was entrusted to Technical Committee B/560, Conservation of tangible cultural heritage.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014. Published by BSI Standards Limited 2014

ISBN 978 0 580 72633 0

ICS 97.195

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 May 2014.

Amendments issued since publication

Date	Text affected
------	---------------

ICS 97.195

English Version

**Conservation of Cultural Heritage - Guidelines and procedures
for choosing appropriate lighting for indoor exhibitions**

Conservation du patrimoine culturel - Lignes directrices et
procédures concernant le choix d'un éclairage adapté pour
les expositions en intérieur

Erhaltung des kulturellen Erbes - Leitlinien und Verfahren
für die Auswahl geeigneter Beleuchtung für
Innenausstellungen

This Technical Specification (CEN/TS) was approved by CEN on 14 October 2013 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents		Page
Foreword.....		4
Introduction		5
1 Scope		6
2 Normative references		6
3 Terms and definitions		6
4 Symbols		11
5 Sensitivity of cultural property to light.....		12
5.1 General.....		12
5.2 Mechanisms of damage		12
5.2.1 General.....		12
5.2.2 Photochemical		12
5.2.3 Radiant heating.....		13
5.2.4 Biological effects		13
5.3 Sensitivity and classification for cultural property.....		14
5.4 Limitations for total luminous exposure		14
6 Light measurement.....		15
6.1 Measurement of illuminance		15
6.2 Measurement of UV radiation		16
7 Exhibition lighting.....		16
7.1 General.....		16
7.2 Viewing conditions		16
7.3 Visual adaptation		16
7.4 Contrast ratios		17
7.5 Colour appearance		17
7.6 Colour rendering.....		17
7.7 Backgrounds to exhibits.....		18
7.7.1 General.....		18
7.7.2 Luminance of backgrounds.....		18
7.7.3 Colour of backgrounds		18
7.8 Glare.....		19
7.9 Modelling		20
7.10 Historic furnishings & interiors.....		21
7.11 Simulation and mock-ups		21
Annex A (informative) Characteristics of light sources		22
A.1 Daylight.....		22
A.2 Electric sources		22
A.2.1 General.....		22
A.2.2 Incandescent lamps		23
A.2.3 Fluorescent lamps		24
A.2.4 Solid State Lighting		24
A.2.5 Metal Halide lamps.....		26
Annex B (informative) Glasses and films characteristics		27

B.1	Glasses	27
B.2	Window films	27
B.3	Other protection	27
	Annex C (informative) Filters	28
	Annex D (informative) Relative damage.....	29
	Annex E (informative) Lamps and lighting attachments	30
	Bibliography.....	31

Foreword

This document (CEN/TS 16163:2014) has been prepared by Technical Committee CEN/TC 346 "Conservation of Cultural Heritage", the secretariat of which is held by UNI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

Lighting is needed for many specific functions in museums and other cultural heritage buildings, for example, for research, conservation and permanent or temporary exhibitions. Lighting is one of the most important factors enabling visitors to fully enjoy works of art and other cultural property. In fact, lighting is a key medium in which visitors interpret and appreciate cultural heritage. Enough light is needed to see well but this may present a challenge when what is being viewed will deteriorate in the presence of light. Where cultural heritage is judged to be worth preserving for future generations it is essential to consider the controlled use of light. Indeed, light is an environmental factor, which is a threat to many objects. Alone or in combination with other environmental factors (temperature, humidity, pollution, etc.) light causes fading, discoloration and embrittlement of a wide range of materials. This damage is cumulative and irreversible: no conservation treatment can restore change of colour or loss in strength of materials damaged by light. Therefore, the challenge of museum exhibition lighting is to find an appropriate compromise between the long term preservation of the exhibit and the needs of visitors to view them within a suitable exhibition design. As an integral part of exhibition lighting, the following aspects should be considered:

- the conservation aspect, related to the sensitivity of the exhibit at different wavelengths of the incident radiant energy, the spectral composition of the light source and the total luminous exposure,
- the visual aspect, related to the impact of lighting on the visitor experience: lighting has to allow visitors to see exhibits on display, with the correct colour perceptions without glare, reflections or insufficient illumination,
- the design aspect related to the concept and position of the exhibition architecture, the point of view of the curator and all others involved in the scenographic and/or didactic objectives of the exhibition.

Due to its non-technical nature the last mentioned aspect cannot be dealt with in this Technical Specification.

This Technical Specification uses terms defined in European (EN 12665 and EN 15898) and International (CIE International lighting vocabulary) terminology standards, but their definitions have been adapted to the intended users of this specification.

1 Scope

This Technical Specification defines the procedures as well as the means to implement adequate lighting, with regard to the conservation policy. It takes visual, exhibition and conservation aspects into account and it also discusses the implications of the lighting design on the safeguarding of cultural property. This Technical Specification gives recommendations on values of minimum and maximum illumination levels. It aims to provide a tool for setting up a common European policy and a guide to help curators, conservators and project managers to assess the correct lighting that can assure the safeguarding of the exhibits. This Technical Specification covers lighting for heritage objects on exhibition in both public and private sites and does not consider lighting in other cultural heritage contexts such as open-air collections, etc.

2 Normative references

Not relevant.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

accent lighting

lighting focused on an exhibit or a group of exhibits to emphasize them

[SOURCE: CIE S 017/E:2011]

3.2

annual luminous exposure

H_m

total luminous exposure per year (unit: lux hours per years, lx h / a)

Note 1 to entry: One year of museum display is approximately 3 000 h. See also 3.35.

3.3

blue wool test: test for light fastness

certified set of eight pieces of wool each dyed with a different specific blue dye graded to fade after a set exposure to light

[SOURCE: ISO 105-B08:1995]

Note 1 to entry: This system is usually referred as Blue Wool Standard (BWS) and it is used in museums to assess the radiation exposure of materials. The eight wool pieces are numbered #1 to #8, each about 2 to 3 times as sensitive as the next. High sensitivity is defined as materials rated #1, #2, or #3; medium as #4, #5, or #6; and low as #7, #8. A panel of selected blue wool samples is left at the measurement point and after a period it can be seen which samples have faded and the dose of light received determined.

3.4

colour rendering

effect of an illuminant on the colour appearance of exhibits by conscious or subconscious comparison with their colour appearance under a reference illuminant

[SOURCE: CIE S 017/E:2011 or IEC-IEV:1987, 845-02-059]

3.5

colour rendering index

R_a

derived from the colour rendering indices for a specified set of 8 test colour samples